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ABSTRACT

This study investigated at the age at which infants become able to discriminate between their mothers and female strangers, as measured by differential patterns of pauses during the infants' crying while being spoken to by their mothers and female strangers. The subjects, 14 infants ranging in age from 7 to 20 days, were fed, burped, and changed, then left in their cribs. After continuous crying had developed for at least 30 seconds, the mother and the female stranger, standing out of sight, spoke to the infant for one minute each. Results indicated that 11 of the 14 infants discriminated by voice alone between their mothers and a female stranger. The infants stopped crying significantly sooner and paused significantly longer when their mothers were speaking to them. It is concluded that one- and two-week-old infants are capable of discriminating between the voices of their mother and strangers. (Author/BRT)

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LATENCY OF CRYING CESSATION: MEASURING INFANTS' DISCRIMINATION OF
MOTHERS' VOICES

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What will be described is a novel approach of examining very young infants' reactions to the voices of different people by measuring the overt behavior of crying. With regard to the area of infant discrimination of mother from other females and the subsequent development of attachment to the mother, the findings reported here suggest that infants are capable of discriminating their mothers much earlier than heretofore recognized.

A number of approaches have been used by investigators interested in determining how soon after birth infants are able to discriminate their mothers from other women. Fear of strangers during the second six months of life has been widely accepted as a major indicant of the development of social discrimination. (Although recent research By Rheingold and Eckerman (1973) has seriously questioned the validity of this commonly accepted concept.) In general, proximity seeking behaviors in the presence of the mother and or avoidance behaviors in the presence of strangers have been used as indices of social discrimination. The earliest period during which such discrimination is thought to occur is around three months (Hurlock, 1968). Singer and Singer (1970) in their developmental text state: "Human children cannot differentiate between adults until they are somewhere between three and six months old (p. 61)."

However, the infant's motor system has to develop for a period of at least several months after birth before such behavioral abilities are sufficiently under control of the infant to be measured. It seemed to the writer that the discriminative abilities of infants were not accurately

I wish to express appreciation to my wife Jo for helping with this research.

gauged because of reliance upon methods requiring prior development of motor skills and coordination. The behavior selected for this experiment was crying, a behavior which most infants can and do willingly engage in soon after birth.

At this point, I would like to mention the only other experiment I am aware of that involved the measurement of crying cessation in young infants in a social discrimination task. Marcy Gekoski (1974) used cessation of crying as a measure of discrimination between mothers and female strangers. In her experiment, the mothers and strangers did not speak to the infants; instead, they picked up and quietly held the infants. The ages of these subjects ranged between 2 and 6 months. Gekoski found that the infants quieted sooner to the nonvocal, physical soothing by their own mothers.

Since crying is an overt behavior, it can easily be measured. By examining crying, the discriminative abilities of very young infants can be measured. The basic assumption underlying the present research was that if infants can discriminate their mothers' voices, their patterns of crying might reveal this discrimination. Cessation or pausing from crying was selected as the measure of attention to adult voices. If infants systematically paused in their crying earlier to their mothers' voices than those of female strangers, such differential responding would be taken as evidence of ability to discriminate mothers from strangers.

In 1973 this author reported that infants from 10 to 20 days of age paused significantly sooner from crying when their mothers spoke to them than when a stranger addressed them (Hulsebus and Hulsebus, 1973).

Reexamination of the procedures revealed two uncontrolled variables which may have affected the outcome. Each adult leaned over the crib in view of the infant as she spoke and the contents of speech varied from adult to adult. It was possible that the infants based their discriminations on either the sight of their mothers and/or the more familiar phrases used by their mothers instead of discriminating on the basis of the adult voices. The research reported here was designed to control these two variables.

Methods

Seventeen infants served as subjects, ranging in age from 7 to 20 days with an average age of 13 days. There were 9 boys and 10 girls. All comparisons were conducted in the infants' homes. All subjects were tested after feeding, burping, and after their diapers were changed. The infants were left in their cribs until they began fussing and their crying developed into a continuous pattern for at least 30 seconds. Continuous crying was defined as the regular occurrence of approximately two to three cries per five seconds interval. Adoption of this criterion decreased the likelihood of the infant stopping crying just before the adult began speaking. Two of the 19 subjects did not develop sufficiently continuous crying; consequently, data were not taken for them. The comparisons were made before the infant's face reddened and other more intense affective indicators developed. For half of the subjects, the mother preceded the female stranger and for the other half this order was reversed. The same individual acted as stranger for all of the subjects.

Two potentially important controls were instituted. The first was to control for the possibility of the sight of the adult acting as a cue. The adult speaking to the infant stood behind the head of the infant, who was in his crib, out of the infant's sight. No one was in the visual field of the infant during the comparisons; all three adults remained in the infants' room during testing.

The second control concerned the contents of the adult speech. In order that the discrimination be made on the basis of voice and not the vocabulary content of what was said, both adults spoke the same phrases to the subject. A paragraph of phrases typically used by many mothers to quiet their children was prepared and followed by the adults (see Appendix A); thus the contents of the adults' speech did not vary. The adults spoke in pleasant tones to the babies.

When the crying had reached the criterion of continuity, the tape recorder was activated as the first adult began speaking; the adult spoke to the infant for 1 minute. A 4-second pause in crying was selected as the criterion pause. The time taken for breathing while crying was much less than the 4-second interval, typically less than a second. After the measures had been taken for the first adult, the infant was quieted by the mother. The baby was placed back in the crib. When crying again met the continuity criterion, the second adult began speaking.

Results

The onset of adult speech and the infant's crying were transcribed by means of a two track event recorder. One track recorded the onset

of adult speech and the second track recorded the infant's cries. The pen was deflected at the beginning of each cry and remained deflected until the cry ended. Thus, the number of cries and the duration of each cry and the number of pauses and duration of each pause were recorded. The time period between the initiation of adult speech and the first criterion length pause in crying was measured for each adult.

Two well practiced observers listened to the tapes and recorded crying patterns. There was very good agreement between the observers. For the measurement of the number of infants who paused sooner to their mothers' voices, there was only one disagreement (11 vs 12 of 14 pausing sooner to the mothers' voice). There was 94% agreement between the observers as to the number of seconds latency to the pausing criterion. The comparison of pauses of at least 2 seconds duration revealed 93% agreement.

Three of the 17 infants did not pause long enough to either adult for their data to be included in the analysis. Of the 14 infants who met the pause criterion, 11 paused first to their mothers' voices. Testing the assumption that infants who can not discriminate their mothers' voices would be just as likely to stop first to either adult ($p = .5$), the probability of this outcome by chance alone is $(.5)^{11}$ or $p < .001$. Latencies from the onset of adult speech and the initial criterion pause to each person were compared by means of a t test for paired observations. By this measure, the infants paused sooner to their mothers' voices ($t = 3.58$, 13 df, $p < .005$, two tail).

Another comparison involved totaling all pauses of at least 2 seconds duration in the presence of each adult. A t test for paired observations revealed that the infants paused significantly longer while their mothers were speaking (t = 3.55, 13 df, p < .005, two tail). Since the infants paused longer to their mothers, one might expect that they would cry more frequently in the stranger's presence. Another t test for paired observations revealed that the frequency of cries was greater while the stranger spoke (t = 2.39, 13 df, p < .05, two tail). A fourth test showed that the duration of cries did not differ between mothers and stranger (t < 1).

There were apparently no sex differences. A t test comparing latencies to criterion pausing to mothers by females and males was not significant (t < 1).

In conclusion, the analysis of crying allows examination of infant social discrimination abilities soon after birth and much sooner than other methods which have been used. The results of these analyses revealed that the infants paused significantly sooner and paused significantly longer when their mothers spoke to them. Considering the controls which were in effect, it can be said that the infants made the discriminations on the basis of the voices of the adults. Thus, infant discrimination between mothers and female strangers has been shown to occur between one and two weeks of age.

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Appendix A

Script for the Adults

Don't cry, _____ (baby's name). Don't cry, _____.

Don't cry.

What's the matter, _____? What's the matter with you?

Don't cry. It's going to be all right.

What's the matter? What's the matter, _____? You

don't need to cry. That's a good baby.

Everything is going to be all right. Everything is going to be
all right. That's better. Now, don't cry. What's the matter?
Are you hungry?

The adults were instructed to speak from the script in pleasant
natural tones. If the script was finished before the minute
was up, they began the script again.